



DEPARTMENT OF HEALTH & HUMAN SERVICES

SFUND RECORDS CTR
1851-94272

Public Health Service
Agency for Toxic Substances
and Disease Registry

Memorandum

Date January 21, 1986

AR0135

From Acting Director
Office of Health Assessment

Subject Health Assessment, San Gabriel Valley
Los Angeles, California

To Mr. Donald W. Hawkins
Public Health Advisor
EPA Region IX

EXECUTIVE SUMMARY

The Environmental Protection Agency (EPA) Region IX Office submitted ground water data from the San Gabriel Valley indicating that perchlorate ion (ClO_4^-) had been detected in 14 residential wells at a maximum concentration of 2.6 ppm. Given the proprietary nature of the laboratory method for quantification, and the poor quality assurance results noted, the data do not prove that perchlorate ion has actually been found. If the presence of perchlorate ion is confirmed, the scientific database on this ion is insufficient to generate either an acute or longer-term health advisory for drinking water.

BACKGROUND

The San Gabriel Valley is located approximately 40 miles east of downtown Los Angeles. Over 90 percent of the water used by the one million residents is obtained from groundwater beneath the Valley. Trichloroethylene (TCE), perchloroethylene (PCE), and carbon tetrachloride have been detected above EPA cancer risk levels in more than one-fourth of the public water supplies tested by the California Department of Health Services (DOHS). The EPA has since identified an industrial facility in the City of Azusa as a potential source of groundwater contamination. This facility was used to develop, test, and produce rocket and jet engines. In an attempt to identify waste disposal by this facility as a source of groundwater contamination, the EPA had water samples from 14 wells surrounding this facility sampled for compounds associated with rocket engine testing. Of the compounds tested, only perchlorates were identified in the ground water. The EPA has forwarded this data to the Agency for Toxic Substances and Disease Registry (ATSDR) for comment on the toxicologic significance of perchlorates in drinking water.

DOCUMENTS REVIEWED

1. Letter from Keith Takata (U.S. EPA) to Don Hawkins (12-23-85) including analytical results of 14 wells tested for the presence of perchlorate ion.

2. Superfund Record of Communications from Don Hawkins to Stephen Margolis (12-26-85).
3. Quality assurance review reports on perchlorate ion from Harold Takenaka (U.S. EPA).

DISCUSSION

The quality assurance reports on perchlorate ion testing are sufficiently weak as to question whether or not perchlorate ion has been detected. The CAL Analytical Laboratory reports using a proprietary colorimetric method for the quantification of perchlorate ion. Colorimetric methods of this sort are semi-quantitative, and often subject to interference by a variety of compounds. The report received by ATSDR makes no mention of what compounds are known to interfere with perchlorate ion determination, or whether or not these interfering compounds were detected. Furthermore, the reported contamination of four of six field blanks strongly suggests that interfering compounds may be to blame for false positive results. The ATSDR recommends resampling of wells and generation of analytical results with acceptable quality assurance findings. It may be beneficial to send these samples, in addition to any remaining previous samples, to another laboratory to confirm perchlorate ion detection.

Ammonium perchlorate and potassium perchlorate have been used as oxidizing agents in rocket fuels. These chemicals have been reported to be corrosive at high concentrations, but the literature is almost void of toxicity studies on these two compounds. Sodium perchlorate has been used therapeutically in the treatment of thyrotoxicosis at high doses (grams). This treatment was abandoned years ago as the development of fatal aplastic anemia was considered a risk from such high doses of this compound. Additional studies in the late 1920's suggest that perchlorate ions are rapidly eliminated with as much as 85 percent of the administered dose found in the urine within 24 hours. The available data on sodium perchlorate in animals suggest that the striated muscle and the central nervous system may also represent additional target organs for perchlorates. In a pilot study by Bercz et. al. (Environmental Health Perspectives, Vol.46, pp. 47-55, 1982), sodium perchlorate administered in drinking water to African Green Monkeys for 30 days at concentrations of 10 and 20 mg/kg/day did not show antithyroid effects. Dr. Bercz indicated that no overt signs of toxicity were observed in these animals (Personal communication).

Based upon this limited data on the toxicity of perchlorate ion, it is not possible to set either an acute or longer-term health advisory in drinking water. The minimal acute toxicity data available suggest that one or two ppm perchlorate ion would not represent an imminently acute and substantial threat to the public health. The ATSDR does not consider this level to be "safe" in the absence of experimental data.

The lack of scientific data on perchlorate ion toxicity make it impossible for the ATSDR to adequately address EPA's questions #1, 2 & 3, in the letter from Keith Takata to Don Hawkins (12-23-85). These questions deal with specific health effects of perchlorates and the setting of "safe" levels of contamination. Regarding question #4, the primary analytical question that needs to be addressed at this time is whether perchlorates are present in the wells, not the nature of the perchlorate salt cation. The minimal data available on the various perchlorate ion salts does not suggest that differing toxicities would be expected. If the compounds were to dissociate at the concentrations reported, neither ammonium, potassium nor sodium cations would be associated with adverse health effects.

Regarding question #5 posed by the EPA, "... What toxicologic testing would be required to be able to answer these questions?", the ATSDR will refer this question to the National Toxicology Program located in Research Triangle Park, North Carolina. More specifically, for ATSDR to quickly evaluate the hazard associated with perchlorate ion in drinking water, these specific questions need answered:

1. Acute toxicity tests - What are the target organs for toxicity and at what concentrations would one expect to find no observable adverse effect (NOAEL)? These questions need to be answered for the oral route of exposure (drinking water) and the dermal route of exposure (bathing).
2. Chronic toxicity tests - What are the target organs and at what lifetime exposure levels would one expect to find no observable adverse effects?
3. Chronic feeding studies to determine if perchlorates cause cancer and, if so, what levels in drinking water are associated with carcinogenicity?
4. Reproductive (teratogenic) studies to determine if perchlorates can adversely effect reproductive outcome.

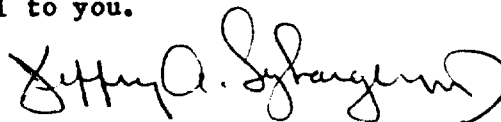
CONCLUSIONS AND RECOMMENDATIONS

The analytical data provided to the ATSDR is insufficient to confirm the presence of perchlorate ion in residential wells in the San Gabriel Valley. Resampling is strongly recommended with subsequent verification of the laboratory results made by two laboratories, one being CAL Labs and the other being a laboratory with experience in perchlorate analysis. Although the limited data available does not suggest that several ppm of

Page 4 - Mr. Donald Hawkins

perchlorates would represent an acute threat to the public health, the effects of continued low-level perchlorate ingestion need to be described as soon as possible.

We hope this information is useful to you.


(for) Stephen Margolis, Ph.D.